Snipes-Dye associates

STORM WATER MANAGEMENT PLAN (SWMP)

Route 67 Self Storage Facility

County of San Diego

R08-001; P08-002; ENV. LOG NO. 08-14-001
KIVA PROJECT NO. 07-0077757

Dated: November 26, 2007
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Revised: March 6, 2009

Prepared By:

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LK0381

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Storm Water Management Plan
For Priority Projects
(Major SWMP)

The Major Stormwater Management Plan (Major SWMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with certain types of development projects. To determine whether your project is required to submit a Major or Minor SWMP please reference the County's Stormwater Intake Form for Development Projects.

Project Name:	Route 67 Self Storage Facility
Permit Number (Land Development Projects):	R08-001; P08-002 ENV. LOG 08-14-001 KIVA 07-0077757
Work Authorization Number (CIP):	
Applicant:	Danube Properties
Applicant's Address:	2055 Third Ave., Suite C, San Diego, CA 92101
Plan Prepare By (*Leave blank if same as applicant*):	Snipes-Dye Associates
Date:	11-15-07
Revision Date (If applicable):	03-06-09

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9926) requires all applications for a permit or approval associated with a Land Disturbance Activity must be accompanied by a Storm Water Management Plan (SWMP) (section 67.806.b). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority development project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date
	YES	NO	
Application Submittal	X		07-02-08
Public Review	X		03-06-09

Instructions for a Major SWMP can be downloaded at
http://www.sdcounty.ca.gov/dpw/watersheds/susmp/susmp.html

Completion of the following checklist and attachments will fulfill the requirements of a Major SWMP for the project listed above.

PROJECT DESCRIPTION

Please provide a brief description of the project in the following box. Please include:

- Project Location
- Project Description
- Physical Features (Topography)
- Surrounding Land Use
- Proposed Project Land Use
- Location of dry weather flows (year-round flows in streams, or creeks) within project limits, if applicable.

The project consist of 37,700 square foot, three story storage facility located at 12410 Lakeside Avenue I the unincorporated Lakeside area of the County of San Diego. The structure will be constructed between two sloping hillsides necessitating the excavation and export of approximately 6,400 cubic yards of material. Several drainage basins connect and convey offsite drainage through the project site. The 2.2 acre site is currently developed and utilized as residential housing. Some construction material storage and other construction activities presently occur on the site. In conjunction with the proposed site development, street widening and improvement of Lakeside Avenue will occur. The project site does not contain areas of dry weather flows.

PRIORITY PROJECT DETERMINATION

Please check the box that best describes the project. Does the project meet one of the following criteria?

Table 1

PRIORITY PROJECT	YES	NO
Redevelopment that creates or adds at least 5,000 net square feet of additional impervious surface area and falls under one of the criteria listed below.	X	
Residential development of more than 10 units		X
Commercial developments with a land area for development of greater than 1 acre	X	
Heavy industrial development with a land area for development of greater than 1 acre		X
Automotive repair shop(s).		X
Restaurants, where the land area for development is greater than 5.000 square feet		X
Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface	X	
Environmentally Sensitive Areas (ESA): All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA . "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.	X	
Parking Lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff		X
Streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater	X	
Retail Gasoline Outlets (RGO) that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.		X

Limited Exclusion: Trenching and resurfacing work associated with utility projects are not considered Priority Development Projects. Parking lots, buildings and other structures associated with utility projects are subject to WPO requirements if one or more of the criteria above are met.

If you answered **NO** to all the questions, then **STOP**. Please complete a Minor SWMP for your project.
If you answered **YES** to any of the questions, please continue.

HYDROMODIFICATION DETERMINATION

The following questions provide a guide to collecting information relevant to hydromodification management issues.

Table 2

	QUESTIONS	YES	NO	Information
1.	Will the proposed project disturb 50 or more acres of land? (Including all phases of development)		X	If YES, continue to 2. If NO, go to 6.
2.	Would the project site discharge directly into channels that are concrete-lined or significantly hardened such as with rip-rap, sackcrete, etc., downstream to their outfall into bays or the ocean?			If NO, continue to 3. If YES, go to 6.
3.	Would the project site discharge directly into underground storm drains discharging directly to bays or the ocean?			If NO, continue to 4. If YES, go to 6.
4.	Would the project site discharge directly to a channel (lined or un-lined) and the combined impervious surfaces downstream from the project site to discharge at the ocean or bay are 70% or greater?			If NO, continue to 5. If YES, go to 6.
5.	Project is required to manage hydromodification impacts.			Hydromodification Management Required as described in Section 67.812 b(4) of the WPO.
6.	Project is not required to manage hydromodification impacts.	X		Hydromodification Exempt. Keep on file.

An exemption to potentially available for projects that are required (No. 5 in Table 2 above) to manage hydromodification impacts: The project proponent may conduct an independent geomorphic study to determine the project's full hydromodification impact. The study must incorporate sediment transport modeling across the range of geomorphically-significant flows and demonstrate to the County's satisfaction that the project flows and sediment reductions will not detrimentally affect the receiving water to qualify for the exemption.

STORMWATER QUALITY DETERMINATION

The following questions provide a guide to collecting information relevant to project stormwater quality issues. Please provide the following information in a printed report accompanying this form.

Table 3

	QUESTIONS	COMPLETED	NA
1.	Describe the topography of the project area.	X	
2.	Describe the local land use within the project area and adjacent areas.	X	
3.	Evaluate the presence of dry weather flow.	X	
4.	Determine the receiving waters that may be affected by the project throughout all phases of development through completion (i.e., construction, long-term maintenance and operation).	X	
5.	For the project limits, list the 303(d) impaired receiving water bodies and their constituents of concern.	X	
6.	Determine if there are any High Risk Areas (which is defined by the presence of municipal or domestic water supply reservoirs or groundwater percolation facilities) within the project limits.	X	
7.	Determine the Regional Board special requirements, including TMDLs, effluent limits, etc.	X	
8.	Determine the general climate of the project area. Identify annual rainfall and rainfall intensity curves.	X	
9.	Determine the soil classification, permeability, erodibility, and depth to groundwater for Treatment BMP consideration.	X	
10.	Determine contaminated or hazardous soils within the project area.	X	
11.	Determine if this project is within the environmentally sensitive areas as defined on the maps in Appendix A of the *County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects.*	X	
10.	Determine if this is an emergency project.	X	

The project topography consists of sloping lands creating a canyon in which the proposed project building will be constructed. Slopes surround the site on the west, north and east sides. The southerly side of the site is adjacent to Lakeside Avenue. The site is currently utilized for residential use. Surrounding landuse is residential to the west and north, vacant to the east, and industrial to the south across Lakeside Avenue. The proposed use of the land is compatible with surrounding uses and in compliance with the current zoning and general plan. There is currently no dry weather surface drainage over the proposed project site. Downstream receiving waters for drainage from this project site are the San Diego River.

The project is located within the San Diego River Basin, Lower San Diego River Hydrologic Unit (907), and Santee Hydrologic Subarea (907.12)

Impaired receiving downstream waters as listed on the 2006, 303 (d) CWA List are: Pacific Ocean Shoreline and the Lower San Diego River. The following are a list of constituents of concern:

Pacific Ocean Shoreline	=	Bacteria Indicators
Lower San Diego River	=	Fecal Coliform
		Low Dissolved Oxygen
		Phosphorus
		Total Dissolved Solids

There are no identified high risk areas of stormwater contamination within the drainage basin associated with the proposed project. There are no identified Regional Board special requirements impacting the project.

The general climate of the site includes rainfall intensity in the six-hour storm for the two year event being 1.5 inches per hour. The identified average annual rainfall for the area according to the County of San Diego, is 13.5 inches. Site soils consist of Cieneba - Fallbrook rocky and Tujunga sand. Cieneba - Fallbrook rocky soils include rock outcroppings and boulders and is considered moderately permeable and excessively drained. Due to the steep slopes associated with this soil type, the soil is very erosive. The Tujunga soil type is representative of alluvial fans and flood plains. The topographic profile of this soil type is relatively flat. Tujunga soils are excessively drained sands derived from granitic alluvium. The Tujunga soils are erosive where surface drainage is concentrated. Groundwater within the project site appears to be in excess of ten feet below the ground surface.
A Phase I study has not been completed for the project site. It is anticipated that no contaminated soils exists within the project area.

WATERSHED

Please check the watershed(s) for the project.

San Juan 901	Santa Margarita 902	San Luis Rey 903	Carlsbad 904
San Dieguito 905	Penasquitos 906	☒ San Diego 907	Sweetwater 909
Otay 910	Tijuana 911	Whitewater 719	Clark 720
West Salton 721	Anza Borrego 722	Imperial 723	

Please provide the hydrologic sub-area and number(s)

Number	Name
907.12	Santee

Please provide the beneficial uses for Inland Surface Waters and Ground Waters. Beneficial Uses can be obtained from the Water Quality Control Plan for the San Diego Basin, which is available at the Regional Board office or at
http://www.waterboards.CA.gov/sandiego/water_issues/programs/basin_plan/index.shtml

SURFACE WATERS	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRESH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Inland Surface Waters																
SD River	907.12	0		X					X	X		X		X	X	
Ground Waters																
Santee	907.12	X	X	X	X											

*** Excepted from Municipal**

X Existing Beneficial Use
0 Potential Beneficial Use

POLLUTANTS OF CONCERN

Using Table 4, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

Table 4. Anticipated and Potential Pollutants Generated by Land Use Type

	General Pollutant Categories								
PDP Categories	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P	X
Commercial Development 1 acre or greater	P(1)	P(1)		P(2)	X	P(5)	X	P(3)	P(5)
Heavy industry /industrial development	X		X	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	
Hillside Development >5,000 ft^2	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Retail Gasoline Outlets			X	X	X	X	X		
Streets, Highways & Freeways	X	P(1)	X	X(4)	X	P(5)	X		

X = anticipated
P = potential
(1) A potential pollutant if landscaping exists on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.

Note: If other monitoring data that is relevant to the project is available. Please include as Attachment C.

Parking = Sediments
Nutrients
Heavy Metals
Organic Compounds
Trash and Debris
Oxygen Demanding Substances
Oil and Grease
Pesticides

Identified pollutants of concern for the proposed project as identified in Table 1. are:

Hillside Development = Sediments
Nutrients
Trash and Debris
Oxygen Demanding Substances
Oil and Grease
Pesticides

CONSTRUCTION BMPs

Please check the construction BMPs that may be implemented during construction of the project. The applicant will be responsible for the placement and maintenance of the BMPs incorporated into the final project design.

- ☒ Silt Fence
- ☒ Fiber Rolls
- ☒ Street Sweeping and Vacuuming
- ☒ Storm Drain Inlet Protection
- ☒ Stockpile Management
- ☒ Solid Waste Management
- ☒ Stabilized Construction Entrance/Exit
- ☐ Dewatering Operations
- ☒ Vehicle and Equipment Maintenance
- ☐ Desilting Basin
- ☒ Gravel Bag Berm
- ☒ Sandbag Barrier
- ☒ Material Delivery and Storage
- ☒ Spill Prevention and Control
- ☒ Concrete Waste Management
- ☒ Water Conservation Practices
- ☒ Paving and Grinding Operations
- ☒ Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

Complete the checklist below to determine if a proposed project will pose an "exceptional threat to water quality," and therefore require Advanced Treatment Best Management Practices.

Table 5

No.	CRITERIA	YES	NO	INFORMATION
1.	Is all or part of the proposed project site within 200 feet of waters named on the Clean Water Act (CWA) Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or turbidity. Current 303d list may be obtained from the following site: http://www.swrcb.ca.gov/tmdl/docs/303dlists2006/approved/r9_06_303d_reqtmdls.pdf		X	If YES, continue to 2. If NO, go to 5.
2.	Will the project disturb more than 5 acres, including all phases of the development?			If YES, continue to 3. If NO, go to 5.
3.	Will the project disturb slopes that are steeper than 4:1 (horizontal: vertical) with at least 10 feet of relief, and that drain toward the 303(d) listed receiving water for sedimentation and/or turbidity			If YES, continue to 4. If NO, go to 5.
4.	Will the project disturb soils with a predominance of USDA-NRCS Erosion factors k_f greater than or equal to 0.4?			If YES, continue to 6. If NO, go to 5.
5.	Project is not required to use Advanced Treatment BMPs	X		Document for Project Files by referencing this checklist.
6.	Project poses an "exceptional threat to water quality" and is required to use Advanced Treatment BMPs.			Advanced Treatment BMPs must be consistent with WPO section 67.811(b)(20)(D) performance criteria.

Exemption potentially available for projects that require advanced treatment: Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that shows to the County official's satisfaction that advanced treatment is not required.

Now that the need for treatment BMPs has been determined, other information is needed to complete the SWMP.

SITE DESIGN

To minimize stormwater impacts, site design measures must be addressed. The following checklist provides options for avoiding or reducing potential impacts during project planning. If YES is checked, it is assumed that the measure was used for this project.

Table 6

	OPTIONS		YES	NO	N/A
1.	Has the project been located and road improvements aligned to avoid or minimize impacts to receiving waters or to increase the preservation of critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions?		X		
2.	Is the project designed to minimize impervious footprint?		X		
3.	Is the project conserving natural areas where feasible?		X		
4.	Where landscape is proposed, are rooftops, impervious sidewalks, walkways, trails and patios be drained into adjacent landscaping?		X		
5.	For roadway projects, are structures and bridges be designed or located to reduce work in live streams and minimize construction impacts?				X
6.	Can any of the following methods be utilized to minimize erosion from slopes:		X		
	6.a.	Disturbing existing slopes only when necessary?	X		
	6.b.	Minimize cut and fill areas to reduce slope lengths?	X		
	6.c.	Incorporating retaining walls to reduce steepness of slopes or to shorten slopes?	X		
	6.d.	Providing benches or terraces on high cut and fill slopes to reduce concentration of flows?			X
	6.e.	Rounding and shaping slopes to reduce concentrated flow?	X		
	6.f.	Collecting concentrated flows in stabilized drains and channels?	X		

LOW IMPACT DEVELOPMENT (LID)

Each numbered item below is a LID requirement of the WPO. Please check the box(s) under each number that best describes the Low Impact Development BMP(s) selected for this project.

Table 7

1. Conserve natural Areas, Soils, and Vegetation-County LID Handbook 2.2.1
☐ Preserve well draining soils (Type A or B)
☐ Preserve Significant Trees
☒ Other. Description: The project development is located on the site to reduce the impact on adjacent steep slopes and erosive soils. Vegetated swales are incorporated into the design to replace the disturbed ephemeral site drainage.
☐ 1. Not feasible. State Reason:
2. Minimize Disturbance to Natural Drainages-County LID Handbook 2.2.2
☐ Set-back development envelope from drainages
☐ Restrict heavy construction equipment access to planned green/open space areas
☒ Other. Description: The northerly reach of the on site natural drainage conveyance will not be disturbed by the development of the project.
☐ 2. Not feasible. State Reason:
3. Minimize and Disconnect Impervious Surfaces (see 5) -County LID Handbook 2.2.3
☐ Clustered Lot Design
☐ Items checked in 5?
☒ Other. Description: Impervious surfaces drain directly to the on site vegetated swale to allow for storm water treatment.
☐ 3. Not feasible. State Reason:
4. Minimize Soil Compaction-County LID Handbook 2.2.4
☒ Restrict heavy construction equipment access to planned green/open space areas
☐ Re-till soils compacted by construction vehicles/equipment
☐ Collect & re-use upper soil layers of development site containing organic materials
☐ Other. Description:
☐ 4. Not feasible. State Reason:
5. Drain Runoff from Impervious Surfaces to Pervious Areas-County LID Handbook 2.2.5

LID Street & Road Design	
☒	Curb-cuts to landscaping
☐	Rural Swales
☐	Concave Median
☐	Cul-de-sac Landscaping Design
☒	Other. Description: Storm water runoff from impervious surfaces is directed through vegetated swales prior to discharge to the subsurface drainage system.
LID Parking Lot Design	
☐	Permeable Pavements
☐	Curb-cuts to landscaping
☐	Other. Description:
LID Driveway, Sidewalk, Bike-path Design	
☐	Permeable Pavements
☒	Pitch pavements toward landscaping
☒	Other. Description: D.G. (permeable) pathway
LID Building Design	
☐	Cisterns & Rain Barrels
☒	Downspout to swale - Roof drains to discharge to grade with drainage directed to site vegetated swales.
☐	Vegetated Roofs
☐	Other. Description:
LID Landscaping Design	
☐	Soil Amendments
☐	Reuse of Native Soils
☒	Smart Irrigation Systems
☒	Street Trees
☐	Other. Description:
☐ 5. Not feasible. State Reason:	

CHANNELS AND DRAINAGE

Complete the following checklist to determine if the project includes work in channels.

Table 8

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?		X		If YES go to 2 If NO go to 13.
2.	Will the project increase velocity or volume of downstream flow?		X		If YES go to 6.
3.	Will the project discharge to unlined channels?	X			If YES go to. 6.
4.	Will the project increase potential sediment load of downstream flow?		X		If YES go to 6.
5.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability?		X		If YES go to 8.
6.	Review channel lining materials and design for stream bank erosion.			X	Continue to 7.
7.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.			X	Continue to 8.
8.	Include, where appropriate, energy dissipation devices at culverts.	X			Continue to 9.
9.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.	X			Continue to 10.
10.	Include, if appropriate, detention facilities to reduce peak discharges.	X			Continue to 11.
11.	"Hardening" natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development.			X	Continue to 12.
12.	Provide other design principles that are comparable and equally effective.			X	Continue to 13.
13.	End	X			

SOURCE CONTROL

Please complete the following checklist for Source Control BMPs. If the BMP is not applicable for this project, then check N/A only at the main category.

Table 9

BMP			YES	NO	N/A
1.	**Provide Storm Drain System Stenciling and Signage**				
	1.a.	All storm drain inlets and catch basins within the project area shall have a stencil or tile placed with prohibitive language (such as: "NO DUMPING – DRAINS TO SAN DIEGO RIVER") and/or graphical icons to discourage illegal dumping.	X		
	1.b.	Signs and prohibitive language and/or graphical icons, which prohibit illegal dumping, must be posted at public access points along channels and creeks within the project area.	X		
2.	**Design Outdoors Material Storage Areas to Reduce Pollution Introduction**				X
	2.a.	This is a detached single-family residential project. Therefore, personal storage areas are exempt from this requirement.			
	2.b.	Hazardous materials with the potential to contaminate urban runoff shall either be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the storm water conveyance system; or (2) protected by secondary containment structures such as berms, dikes, or curbs.			
	2.c.	The storage area shall be paved and sufficiently impervious to contain leaks and spills.			
	2.d.	The storage area shall have a roof or awning to minimize direct precipitation within the secondary containment area.			
3.	**Design Trash Storage Areas to Reduce Pollution Introduction**				
	3.a.	Paved with an impervious surface, designed not to allow run-on from adjoining areas, screened or walled to prevent off-site transport of trash; or,	X		
	3.b.	Provide attached lids on all trash containers that exclude rain, or roof or awning to minimize direct precipitation.	X		
4.	**Use Efficient Irrigation Systems & Landscape Design**				
	The following methods to reduce excessive irrigation runoff shall be considered, and incorporated and implemented where determined applicable and feasible.				
	4.a.	Employing rain shutoff devices to prevent irrigation after precipitation.	X		
	4.b.	Designing irrigation systems to each landscape area's specific water requirements.	X		
	4.c.	Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.	X		
	4.d.	Employing other comparable, equally effective, methods to reduce irrigation water runoff.	X		

	BMP		YES	NO	N/A
5.	**Private Roads**				
	The design of private roadway drainage shall use at least one of the following				X
	5.a.	Rural swale system: street sheet flows to vegetated swale or gravel shoulder, curbs at street corners, culverts under driveways and street crossings.			
	5.b.	Urban curb/swale system: street slopes to curb, periodic swale inlets drain to vegetated swale/biofilter.			
	5.c.	Dual drainage system: First flush captured in street catch basins and discharged to adjacent vegetated swale or gravel shoulder, high flows connect directly to storm water conveyance system.			
	5.d.	Other methods that are comparable and equally effective within the project.			
6.	**Residential Driveways & Guest Parking**				
	The design of driveways and private residential parking areas shall use one at least of the following features.				X
	6.a.	Design driveways with shared access, flared (single lane at street) or wheelstrips (paving only under tires); or, drain into landscaping prior to discharging to the storm water conveyance system.			
	6.b.	Uncovered temporary or guest parking on private residential lots may be: paved with a permeable surface; or, designed to drain into landscaping prior to discharging to the storm water conveyance system.			
	6.c.	Other features which are comparable and equally effective.			
7.	**Dock Areas**				
	Loading/unloading dock areas shall include the following.				X
	7.a.	Cover loading dock areas, or design drainage to preclude urban run-on and runoff.			
	7.b.	Direct connections to storm drains from depressed loading docks (truck wells) are prohibited.			
	7.c.	Other features which are comparable and equally effective.			
8.	**Maintenance Bays**				
	Maintenance bays shall include the following.				X
	8.a.	Repair/maintenance bays shall be indoors; or, designed to preclude urban run-on and runoff.			
	8.b.	Design a repair/maintenance bay drainage system to capture all wash water, leaks and spills. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.			
	8.c.	Other features which are comparable and equally effective.			
9.	**Vehicle Wash Areas**				
	Priority projects that include areas for washing/steam cleaning of vehicles shall use the following.				X

BMP			YES	NO	N/A
	9.a.	Self-contained; or covered with a roof or overhang.			
	9.b.	Equipped with a clarifier or other pretreatment facility.			
	9.c.	Properly connected to a sanitary sewer.			
	9.d.	Other features which are comparable and equally effective.			
10.	**Outdoor Processing Areas**				
	Outdoor process equipment operations, such as rock grinding or crushing, painting or coating, grinding or sanding, degreasing or parts cleaning, waste piles, and wastewater and solid waste treatment and disposal, and other operations determined to be a potential threat to water quality by the County shall adhere to the following requirements.				X
	10.a.	Cover or enclose areas that would be the most significant source of pollutants; or, slope the area toward a dead-end sump; or, discharge to the sanitary sewer system following appropriate treatment in accordance with conditions established by the applicable sewer agency.			
	10.b.	Grade or berm area to prevent run-on from surrounding areas.			
	10.c.	Installation of storm drains in areas of equipment repair is prohibited.			
	10.d.	Other features which are comparable or equally effective.			
11.	**Equipment Wash Areas**				
	Outdoor equipment/accessory washing and steam cleaning activities shall be.				
	11.a.	Be self-contained; or covered with a roof or overhang.			
	11.b.	Be equipped with a clarifier, grease trap or other pretreatment facility, as appropriate			
	11.c.	Be properly connected to a sanitary sewer.			
	11.d.	Other features which are comparable or equally effective.			
12.	**Parking Areas**				
	The following design concepts shall be considered, and incorporated and implemented where determined applicable and feasible by the County.				
	12.a.	Where landscaping is proposed in parking areas, incorporate landscape areas into the drainage design.	X		
	12.b.	Overflow parking (parking stalls provided in excess of the County's minimum parking requirements) may be constructed with permeable paving.			X
	12.c.	Other design concepts that are comparable and equally effective.	X		
13.	**Fueling Area**				
	Non-retail fuel dispensing areas shall contain the following.				X

	BMP		YES	NO	N/A
	13.a.	Overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. The fueling area shall drain to the project's treatment control BMP(s) prior to discharging to the storm water conveyance system.			
	13.b.	Paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete shall be prohibited.			
	13.c.	Have an appropriate slope to prevent ponding, and must be separated from the rest of the site by a grade break that prevents run-on of urban runoff.			
	13.d.	At a minimum, the concrete fuel dispensing area must extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 foot (0.3 meter), whichever is less.			

Please list other project specific Source Control BMPs in the following box. Write **N/A** if there are none.

N/A - No additional source control best management practices identified.

TREATMENT CONTROL

To select a structural treatment BMP using Treatment Control BMP Selection Matrix (Table 10), each priority project shall compare the list of pollutants for which the downstream receiving waters are impaired (if any), with the pollutants anticipated to be generated by the project (as identified in Table 4). Any pollutants identified by Table 4, which are also causing a Clean Water Act section 303(d) impairment of the receiving waters of the project, shall be considered primary pollutants of concern. Priority projects that are anticipated to generate a primary pollutant of concern shall select a single or combination of stormwater BMPs from Table 10, which **maximizes pollutant removal** for the particular primary pollutant(s) of concern.

Priority projects that are **not** anticipated to generate a pollutant for which the receiving water is CWA 303(d) impaired shall select a single or combination of stormwater BMPs from Table 10, which are effective for pollutant removal of the identified secondary pollutants of concern, consistent with the "maximum extent practicable" standard.

Table 10. Treatment Control BMP Selection Matrix

Pollutants of Concern	Bioretention Facilities (LID)*	Settling Basins (Dry Ponds)	Wet Ponds and Wetlands	Infiltration Facilities or Practices (LID)*	Media Filters	High-rate biofilters	High-rate media filters	Trash Racks & Hydro -dynamic Devices
Coarse Sediment and Trash	High	High	High	High	High	High	High	High
Pollutants that tend to associate with fine particles during treatment	High	High	High	High	High	Medium	Medium	Low
Pollutants that tend to be dissolved following treatment	Medium	Low	Medium	High	Low	Low	Low	Low

*Additional information is available in the County of San Diego LID Handbook.

Notes on Pollutants of Concern:

In Table 11, Pollutants of Concern are grouped as gross pollutants, pollutants that tend to associate with fine particles, and pollutants that remain dissolved.

Table 11

Pollutant	Coarse Sediment and Trash	Pollutants that tend to associate with fine particles during treatment	Pollutants that tend to be dissolved following treatment
Sediment	X	X	
Nutrients		X	X
Heavy Metals		X	
Organic Compounds		X	
Trash & Debris	X		
Oxygen Demanding		X	
Bacteria		X	
Oil & Grease		X	
Pesticides		X	

A Treatment BMP must address runoff from developed areas. Please provide the post-construction water quality treatment volume or flow values for the selected project Treatment BMP(s). Guidelines for design calculations are located in Chapter 5, Section 4.3, Principle 8 of the County SUSMP. Label outfalls on the BMP map. The Water Quality peak rate of discharge flow (Q_{WQ}) and the Water Quality storage volume (V_{WQ}) is dependent on the type of treatment BMP selected for the project.

Outfall	Tributary Area (acres)	Q_{WQ} (cfs)	V_{WQ} (ft^3)
4	0.82	0.072	N/A
16	0.42	0.076	N/A

Please check the box(s) that best describes the Treatment BMP(s) selected for this project.

Biofilters	
☐	Bioretention swale
☒	Vegetated filter strip
☐	Stormwater Planter Box (open-bottomed)
☐	Stormwater Flow-Through Planter (sealed bottom)
☐	Bioretention Area
☐	Vegetated Roofs/Modules/Walls
Detention Basins	
☐	Extended/dry detention basin with grass/vegetated lining
☐	Extended/dry detention basin with impervious lining
Infiltration Basins	
☐	Infiltration basin
☐	Infiltration trench
☐	Dry well
☐	Permeable Paving
☐	Gravel
☐	Permeable asphalt
☐	Pervious concrete
☐	Unit pavers, ungrouted, set on sand or gravel
☐	Subsurface reservoir bed
Wet Ponds or Wetlands	
☐	Wet pond/basin (permanent pool)
☐	Constructed wetland
Filtration	
☐	Media filtration
☐	Sand filtration
Hydrodynamic Separator Systems	
☐	Swirl Concentrator
☐	Cyclone Separator
Trash Racks and Screens	

Include Treatment Datasheet as Attachment E. The datasheet should include the following:	**COMPLETED**	**NO**
1. Description of how treatment BMP was designed. Provide a description for each type of treatment BMP.	X	
2. Engineering calculations for the BMP(s)	X	

Please describe why the selected treatment BMP(s) was selected for this project. For projects utilizing a low performing BMP, please provide a detailed explanation.

Treatment best management practices proposed for this project were selected considering the viability of the potential treatment and the availability of area to incorporate the best management practice. Site development conditions limit the selection of treatment BMP's to grass bio-swales. The grass swale retention of the 85th percentile intensity discharge from the developed site is appropriately sized to allow for sufficient treatment time. Please refer to attached calculations.

MAINTENANCE

Please check the box that best describes the maintenance mechanism(s) for this project. Guidelines for each category are located in Chapter 5, Section 5.2 of the County SUSMP.

CATEGORY	SELECTED	
	YES	NO
First	X	
Second[1]		X
Third[1]		X
Fourth		X

Note:
1. Projects in Category 2 or 3 may choose to establish or be included in a Stormwater Maintenance Assessment District for the long-term maintenance of treatment BMPs.

The long term maintenance of the proposed vegetated swales will be the responsibility of the property owner.

ATTACHMENTS

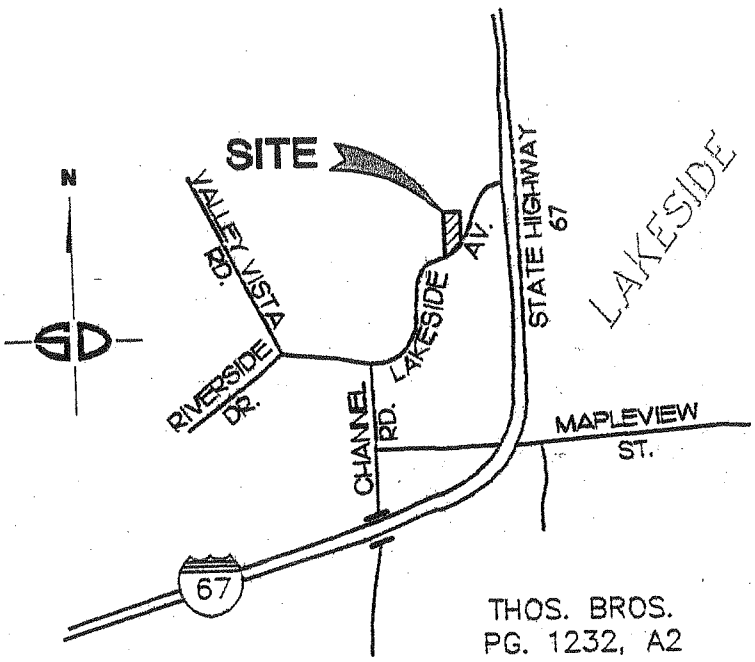
Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	X	
B	Site Map	X	
C	Relevant Monitoring Data		X
D	LID and Treatment BMP Location Map	X	
E	Treatment BMP Datasheets	X	
F	Operation and Maintenance Program for Treatment BMPs	X	
G	Fiscal Resources	X	
H	Certification Sheet	X	
I	Addendum	X	

Note: Attachments A and B may be combined.

ATTACHMENT A

PROJECT LOCATION MAP



VICINITY MAP

NO SCALE

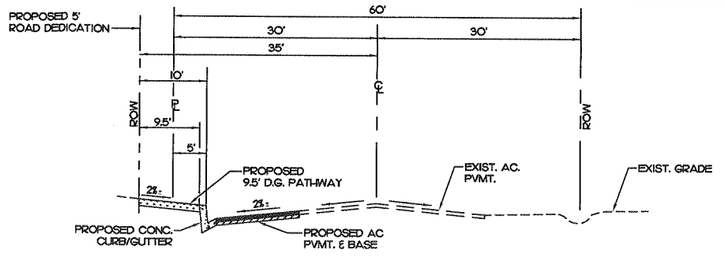
ATTACHMENT B

SITE MAP

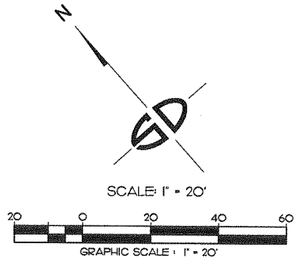
LEGEND :

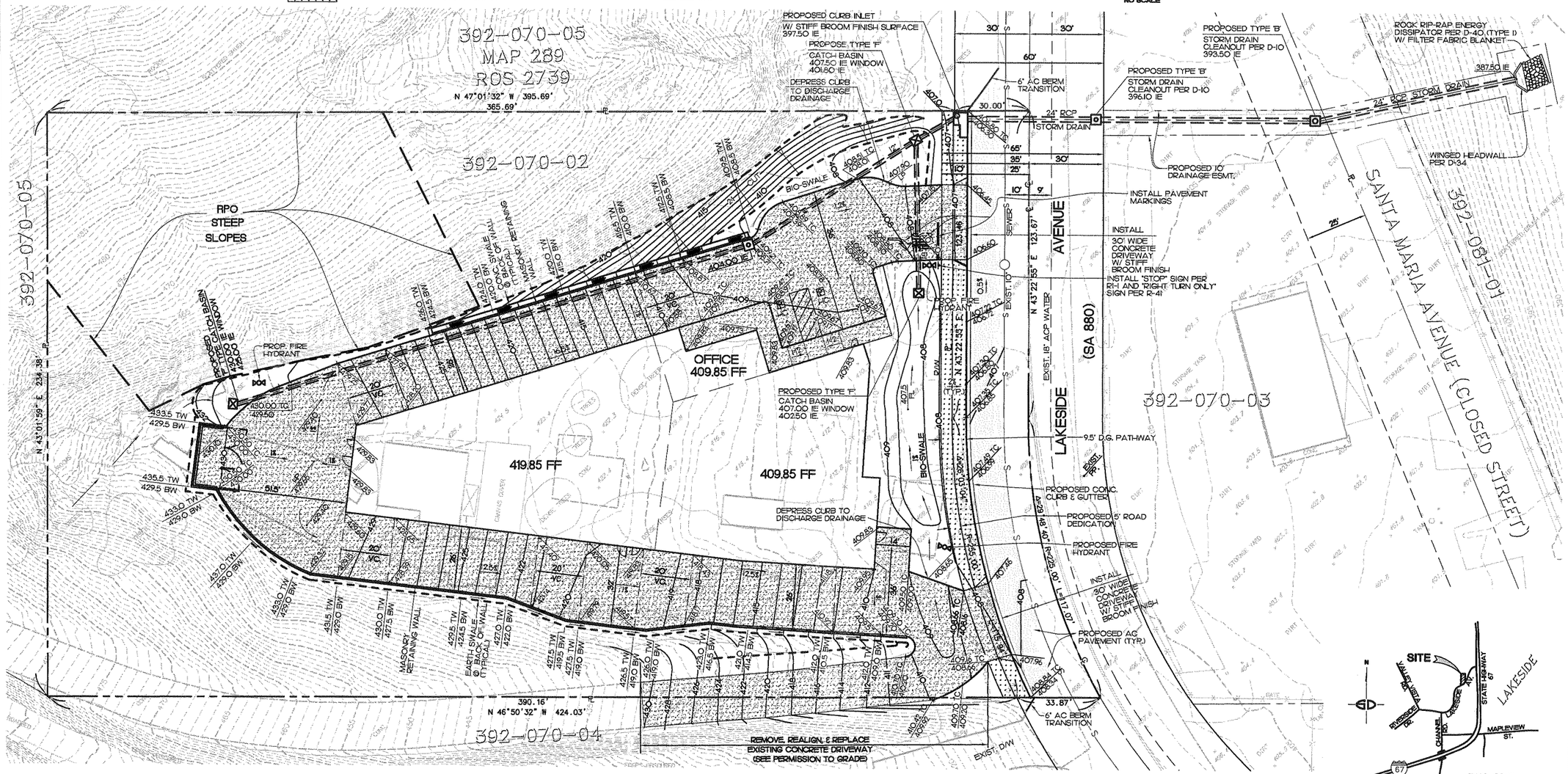
ITEM	STD. DWG.	SYMBOL
EXISTING CONTOUR		450
PROPOSED CONTOUR		410
PROPOSED SPOT ELEVATION		429.25
EXISTING SPOT ELEVATION		x 406.6
BUILDING PERIMETER		
RETAINING WALL		
CONCRETE CURB		
CONCRETE CURB/ GUTTER		
DISINTEGRATED GRANITE (D.G.)		

ITEM	STD. DWG.	SYMBOL
PROPOSED CUT/FILL SLOPE (2:1 MAX)		
DIRECTION OF DRAINAGE (1% MIN.)		
EDGE OF PAVEMENT		
CONCRETE PAVEMENT		
A.C. PAVEMENT		
TYPE F CATCH BASIN		
TYPE B CURB INLET		
TYPE A CLEANOUT		
RCP STORM DRAIN		



TYPICAL SECTION LAKESIDE AVENUE
NO SCALE





VICINITY MAP
NO SCALE

BENCH MARK :

COUNTY OF SAN DIEGO BENCHMARK EC 0207
BRASS DISC IN CONCRETE CURB, 0.4 MILES SOUTH-WEST CORNER OF INTERSECTION OF LAKESIDE DR. AND VISTA CAMINO.
ELEVATION = 387.151

SITE ADDRESS :

12410 LAKESIDE AVENUE
LAKESIDE, CA 92040

ASSESSOR PARCEL NUMBER :

392-070-02

APPLICANT/OWNER :

DANUBE PROPERTIES
2055 THIRD AVENUE, SUITE C
SAN DIEGO, CA 92101

MOE ROSENBERG
7770 REGENTS RD. # 113-192
SAN DIEGO, CA 92122-1967
(858) 864-7741

TOPOGRAPHY :

TOPOGRAPHY BY :
SAN-LO AERIAL SURVEYS
1-05

EARTHWORK QUANTITIES

EXCAVATION :	6,800	C.Y.
EMBANKMENT :	0	C.Y.
EXPORT :	6,800	C.Y.

NOTE:

THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VAILD GRADING PERMISSIONS BEFORE COMMENCING SUCH ACTIVITY.

ENGINEER OF WORK

ENGINEER OF WORK
Snipes-Dye associates
civil engineers and land surveyors
8348 CENTER DRIVE, STE. G, LA MESA, CA 91942
TELEPHONE (619) 697-9234 FAX (619) 460-2033

ROBERT L. BRUCKART R.C.E. 48158
EXPIRES 06-30-10
3-3-09

REGISTERED PROFESSIONAL ENGINEER ROBERT L. BRUCKART No. 48158 Exp. 6-30-10 CIVIL STATE OF CALIFORNIA

PRELIMINARY GRADING PLAN

R08-001, P08-002, ER08-14-001

REVISION	BY

RML ARCHITECTS
ARCHITECTURE • PLANNING • INTERIOR DESIGN
8330 UNIVERSITY AVENUE (619) 465-2011
LA MESA, CA 91941 FAX: (619) 465-2833
CONTACT: RICK MARRS (619) 465-2713
RICK@RMLARCHITECTS.COM

ROUTE 67 STORAGE

OWNER: DANUBE PROPERTIES, INC.
2055 3rd Avenue, Suite 200
San Diego, Ca. 92101 (619) 295-2247 (x224)

PROJECT

SELF STORAGE

LAKESIDE AVE.

DATE:	3-3-09
SCALE:	1"=20'
DRAWN:	BW
JOB NO:	LK0381
SHEET	C1

ATTACHMENT C

RELEVANT MONITORING DATA

***(NOTE:** PROVIDE RELEVANT WATER QUALITY MONITORING DATA IF AVAILABLE.)*

NONE AVAILABLE

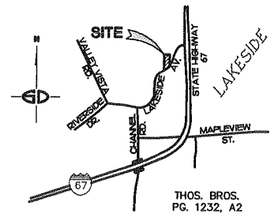
ATTACHMENT D

LID AND TREATMENT BMP LOCATION MAP

LEGEND :

ITEM	STD. DWG.	SYMBOL
EXISTING CONTOUR		460
PROPOSED CONTOUR		410
PROPOSED SPOT ELEVATION		479.25
EXISTING SPOT ELEVATION		x 406.6
BUILDING PERIMETER		
RETAINING WALL		
CONCRETE CURB		
CONCRETE CURB/ GUTTER		
DISINTEGRATED GRANITE (D.G.)		

ITEM	STD. DWG.	SYMBOL
PROPOSED CUT/FILL SLOPE (2H MAX)		
DIRECTION OF DRAINAGE (1% MIN)		
EDGE OF PAVEMENT		
CONCRETE PAVEMENT		
A.C. PAVEMENT		
TYPE F CATCH BASIN		
TYPE B CURB INLET		
TYPE A CLEANOUT		
PVC STORM DRAIN		



THOS. BROS.
PG. 1232, A2

VICINITY MAP
NO SCALE

SCALE: 1" = 20'

20 0 20 40 60

GRAPHIC SCALE : 1" = 20'

392-070-05
MAP 289
ROS 2739
N 47°01'32" W 395.69'
385.69'
392-070-02
392-070-03
392-070-04
392-031-01
N 43°01'59" E 234.38' P
390.16'
N 46°50'32" W 424.03'
419.85 FF
409.85 FF
OFFICE
409.85 FF
PROPOSED CURB INLET W/ STIFF BROOM FINISH SURFACE 397.50 IE.
PROPOSE TYPE 'F' CATCH BASIN 407.50 IE WINDOW 400.50 IE
DEPRESS CURB TO DISCHARGE DRAINAGE
PROPOSED TYPE 'F' CATCH BASIN 407.00 IE WINDOW 402.50 IE.
DEPRESS CURB TO DISCHARGE DRAINAGE
6" A.C. BERM TRANSITION
24" RCP STORM DRAIN
PROPOSED TYPE 'B' STORM DRAIN CLEANOUT PER D-10 396.10 IE
PROPOSED TYPE 'B' STORM DRAIN CLEANOUT PER D-10 393.50 IE
ROCK RIP-RAP ENERGY DISSIPATOR PER D-40 (TYPE I) W/ FILTER FABRIC BLANKET
387.50 IE
WINGED HEADWALL PER D-34
ROCK ENERGY DISSIPATOR
PROPOSED 10' DRAINAGE ESMT.
GRASS SWALE BIO-FILTER
INSTALL 30' WIDE CONCRETE DRIVEWAY W/ STIFF BROOM FINISH
INSTALL "STOP" SIGN PER R1-1 AND "RIGHT TURN ONLY" SIGN PER R-41
LAKESIDE AVENUE (SA 880)
SANTA MARIA AVENUE (CLOSED STREET)
392-070-03
GRASS SWALE BIO-FILTER
9.5' D.G. PATHWAY
PROPOSED CONC. CURB & GUTTER
PROPOSED 5' ROAD DEDICATION
PROPOSED FIRE HYDRANT
INSTALL 30' WIDE CONCRETE DRIVEWAY W/ STIFF BROOM FINISH
PROPOSED AC PAVEMENT (TYP.)
EXIST. 16" ACP WATER
EXIST. D/W
REMOVE, REALIGN, & REPLACE EXISTING CONCRETE DRIVEWAY (SEE PERMISSION TO GRADE)
33.87'
6" AC BERM TRANSITION
BIO-SWALE
EARTH SWALE @ BACK OF WALL (TYPICAL)
MASONRY RETAINING WALL
PROP. FIRE HYDRANT
PROPOSED TYPE 'F' CATCH BASIN 407.00 IE WINDOW 402.50 IE.
DEPRESS CURB TO DISCHARGE DRAINAGE

LOW IMPACT DEVELOPMENT BEST MANAGEMENT PRACTICES

1. CONSERVE NATURAL AREAS AND VEGETATION
2. MINIMIZE DISTURBANCE TO NATURAL DRAINAGE COURSE
3. MINIMIZE AND DISCONNECT IMPERVIOUS SURFACES. DRAIN TO VEGETATED SWALE.
4. MINIMIZE SOIL COMPACTION. RESTRICT HEAVY CONSTRUCTION EQUIPMENT ACCESS.
5. DRAIN RUNNOFF FROM IMPERVIOUS SURFACES TO PERVIOUS AREAS.
6. SMART IRRIGATION SYSTEM AND STREET TREES.

ENGINEER OF WORK

ENGINEER OF WORK
Snipes-Dye associates
civil engineers and land surveyors
8348 CENTER DRIVE, STE. G, LA MESA, CA 91942
TELEPHONE (619) 697-9234 FAX (619) 460-2033
ROBERT L. BRUCKART R.C.E. 48158
EXPIRES 06-30-10

REGISTERED PROFESSIONAL ENGINEER — ROBERT L. BRUCKART — No. 48158 — Exp. 6-30-10 — CIVIL — STATE OF CALIFORNIA

TREATMENT BMP MAP
LID MAP

REVISION	BY

RMI ARCHITECTS
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RICK@RMI-ARCHITECTS.COM

ROUTE 67 STORAGE

CONTACT: MOE ROSENBERG
7770 REGENTS RD. # 113-192
SAN DIEGO, CA 92122-1967
(858) 864-7741

PROJECT

DATE: 7-2-08
SCALE: 1"-20'
DRAWN: MH
JOB NO: LK0381
SHEET

ATTACHMENT E

TREATMENT BMP DATA SHEET

***(NOTE:** POSSIBLE SOURCE FOR DATASHEETS CAN BE FOUND AT WWW.CABMPHANDBOOKS.COM. INCLUDE ENGINEERING CALCULATIONS FOR SIZING THE TREATMENT BMP.)*

SNIPES-DYE ASSOCIATES
Civil Engineers & Land Surveyors
8348 Center Drive Ste. G
LA MESA, CALIFORNIA 91942-2910
(619) 697-9234 FAX (619) 460-2033

JOB Route 67 Self Storage
SHEET NO. Inlet Filter Sizing Calc OF
CALCULATED BY RLB DATE 4-27-07
CHECKED BY DATE
SCALE LK0381

Determine Catch Basin Filter Sizing for Flow Based 85th Percentile Storm Event =

Flow based calculation utilizing rational method:

$Q = CIA$

Q = peak discharge
C = runoff coefficient (0.90)
I = intensity (0.2 for 85th percentile)
A = basin area

Size filter at node 4:

A = 0.04 + 0.36 = 0.40 acres
C = 0.9
I = 0.2

$Q = CIA = (0.9)(0.2)(0.40) = 0.072$ cfs
$= 32$ gpm

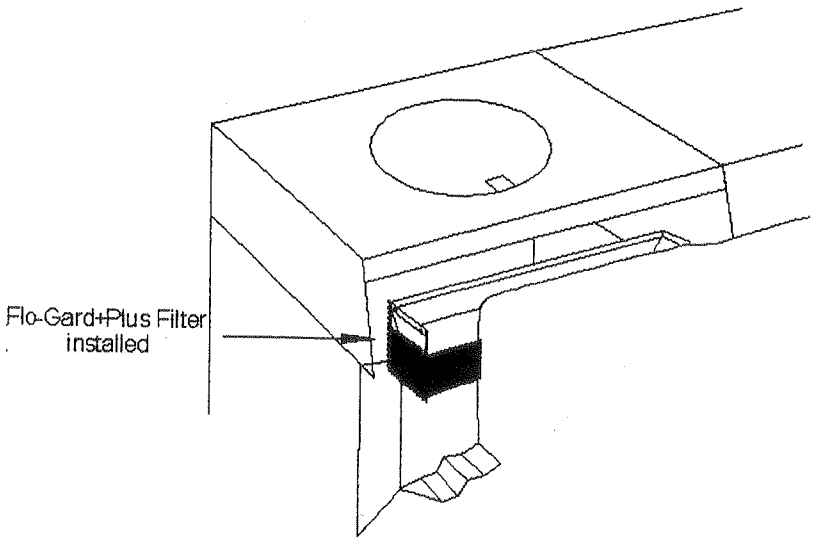
Size filter at node 16 =

A = 0.05 + 0.30 + 0.07 = 0.42 acres
C = 0.9
I = 0.2

$Q = CIA = (0.9)(0.2)(0.42) = 0.076$ cfs
$= 34$ gpm

Utilize FLO-GARD + PLUS Catch Basin Filter inserts @ nodes 4 and 16 =

Model FGP-36CI capacity 1.4 cfs = 1.29 gpm



Model No.	Inlet width (in)	Grate OD (in x in)	Solids Storage Cap. (cu ft)	Filtered Flow (cfs)	Initial Bypass Cap. (cfs)	Secondary Bypass Cap. (cfs)	Total Bypass Cap. (cfs)
FGP-24CI	24	NA	0.9	0.8	5.5	0.1	5.6
FGP-30CI	30	NA	1.1	1.0	6.5	0.2	6.7
FGP-36CI	36	NA	1.4	1.2	7.5	0.2	7.7
FGP-42CI	42	NA	1.6	1.4	8.6	0.2	8.8
FGP-48CI	48	NA	1.9	1.5	9.6	0.3	9.9
FGP-5CI	60	NA	2.3	1.8	11.3	0.3	11.6
FGP-6CI	72	NA	2.8	2.2	13.4	0.4	13.8
FGP-7CI	84	NA	3.2	2.5	15.5	0.4	15.9
FGP-8CI	96	NA	3.7	2.9	17.5	0.5	18.0
FGP-10CI	120	NA	4.6	3.5	21.3	0.6	21.9
FGP-12CI	144	NA	5.6	4.2	25.4	0.8	26.2
FGP-14CI	168	NA	6.5	4.9	29.2	0.9	30.1
FGP-16CI	192	NA	7.5	5.6	33.4	1.0	34.4
FGP-18CI	216	NA	8.3	6.2	37.2	1.1	38.3
FGP-21CI	252	NA	9.7	7.2	43.0	1.3	44.3
FGP-28CI	336	NA	13.0	9.5	56.8	1.8	58.5

NOTES:

1. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.
2. Filtered flow rate includes a safety factor of 2.
3. Flo-Gard+Plus Catch Basin Filter Inserts are available in the standard sizes (see above) or in custom sizes. Call for details on custom size inserts.
4. Flo-Gard+Plus filter inserts should be used in conjunction with a regular maintenance program. Refer to manufacturer's recommended maintenance guidelines.

US PATENT PENDING

FLO-GARD™ +PLUS

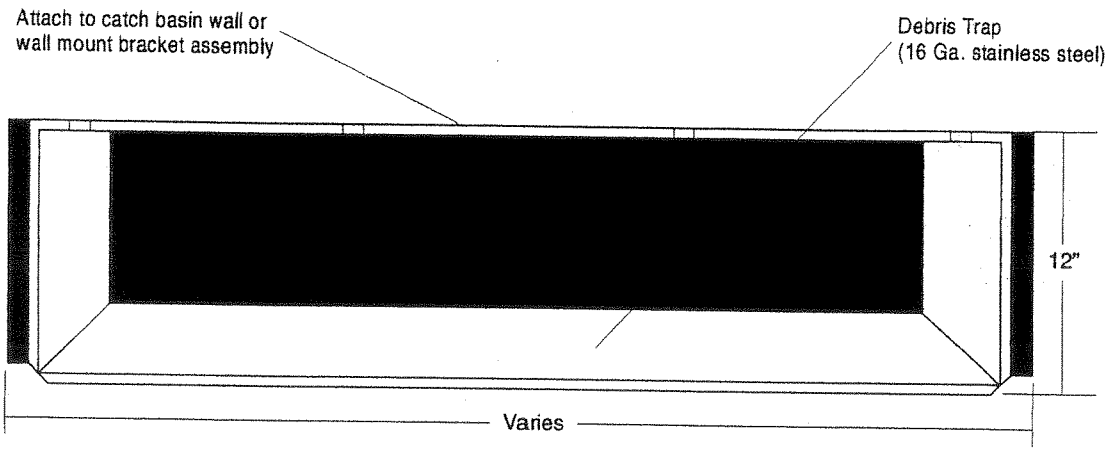
CATCH BASIN FILTER INSERT

(Curb Mount)

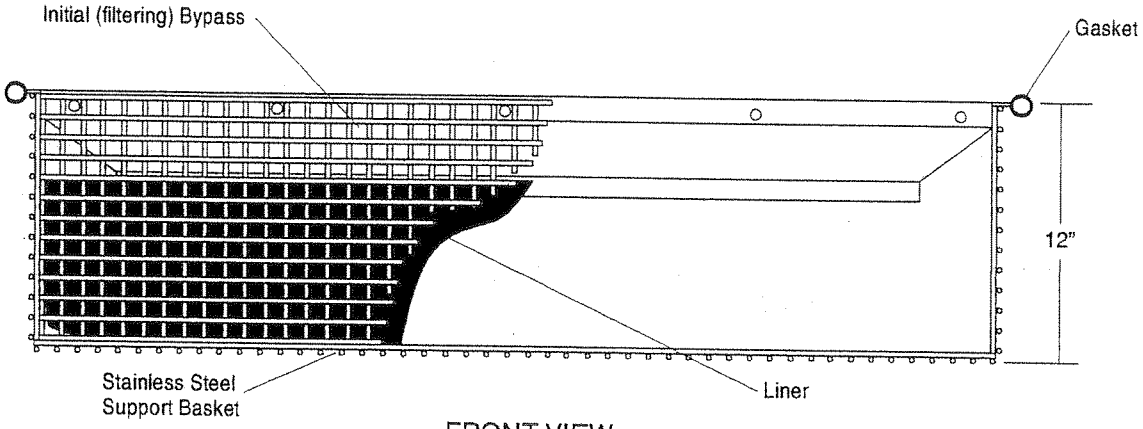
FLAT GRATED INLET

SHEET 1 OF 2

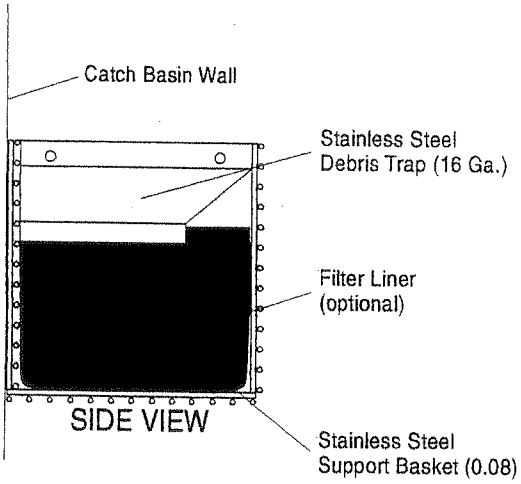
KriStar Enterprises, Inc., Santa Rosa, CA (800) 579-8819



TOP VIEW



FRONT VIEW



FLOGARD+PLUS™

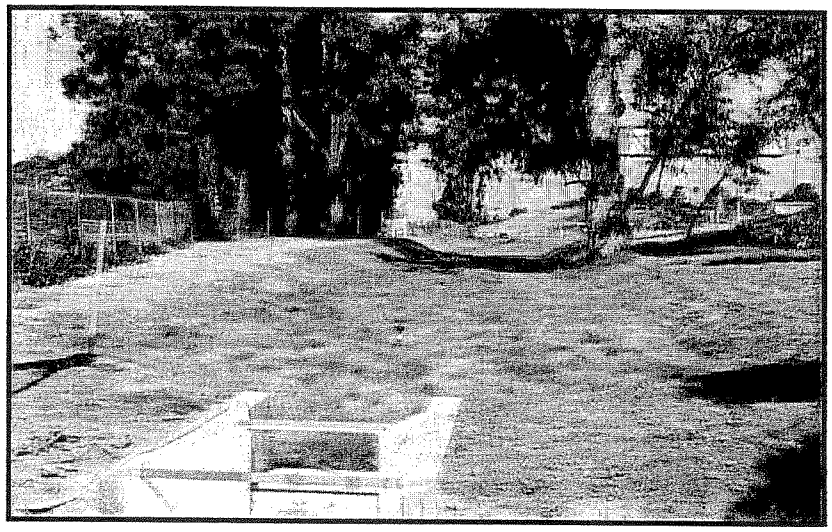
CATCH BASIN FILTER INSERT

(CURB OPENING STYLE)

SHEET 2 OF 2

KriStar Enterprises, Inc., Santa Rosa, CA (800) 579-8819

Vegetated Swale TC-30



Design Considerations

- Tributary Area
- Area Required
- Slope
- Water Availability

Description

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems.

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	●
☑	Metals	▲
☑	Bacteria	●
☑	Oil and Grease	▲
☑	Organics	▲

Legend *(Removal Effectiveness)*

● Low ■ High

▲ Medium

California Experience

Caltrans constructed and monitored six vegetated swales in southern California. These swales were generally effective in reducing the volume and mass of pollutants in runoff. Even in the areas where the annual rainfall was only about 10 inches/yr, the vegetation did not require additional irrigation. One factor that strongly affected performance was the presence of large numbers of gophers at most of the sites. The gophers created earthen mounds, destroyed vegetation, and generally reduced the effectiveness of the controls for TSS reduction.

Advantages

- If properly designed, vegetated, and operated, swales can serve as an aesthetic, potentially inexpensive urban development or roadway drainage conveyance measure with significant collateral water quality benefits.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible.

Limitations

- Can be difficult to avoid channelization.
- May not be appropriate for industrial sites or locations where spills may occur
- Grassed swales cannot treat a very large drainage area. Large areas may be divided and treated using multiple swales.
- A thick vegetative cover is needed for these practices to function properly.
- They are impractical in areas with steep topography.
- They are not effective and may even erode when flow velocities are high, if the grass cover is not properly maintained.
- In some places, their use is restricted by law: many local municipalities require curb and gutter systems in residential areas.
- Swales are mores susceptible to failure if not properly maintained than other treatment BMPs.

Design and Sizing Guidelines

- Flow rate based design determined by local requirements or sized so that 85% of the annual runoff volume is discharged at less than the design rainfall intensity.
- Swale should be designed so that the water level does not exceed 2/3rds the height of the grass or 4 inches, which ever is less, at the design treatment rate.
- Longitudinal slopes should not exceed 2.5%
- Trapezoidal channels are normally recommended but other configurations, such as parabolic, can also provide substantial water quality improvement and may be easier to mow than designs with sharp breaks in slope.
- Swales constructed in cut are preferred, or in fill areas that are far enough from an adjacent slope to minimize the potential for gopher damage. Do not use side slopes constructed of fill, which are prone to structural damage by gophers and other burrowing animals.
- A diverse selection of low growing, plants that thrive under the specific site, climatic, and watering conditions should be specified. Vegetation whose growing season corresponds to the wet season are preferred. Drought tolerant vegetation should be considered especially for swales that are not part of a regularly irrigated landscaped area.
- The width of the swale should be determined using Manning's Equation using a value of 0.25 for Manning's n.

Construction/Inspection Considerations

- Include directions in the specifications for use of appropriate fertilizer and soil amendments based on soil properties determined through testing and compared to the needs of the vegetation requirements.
- Install swales at the time of the year when there is a reasonable chance of successful establishment without irrigation; however, it is recognized that rainfall in a given year may not be sufficient and temporary irrigation may be used.
- If sod tiles must be used, they should be placed so that there are no gaps between the tiles; stagger the ends of the tiles to prevent the formation of channels along the swale or strip.
- Use a roller on the sod to ensure that no air pockets form between the sod and the soil.
- Where seeds are used, erosion controls will be necessary to protect seeds for at least 75 days after the first rainfall of the season.

Performance

The literature suggests that vegetated swales represent a practical and potentially effective technique for controlling urban runoff quality. While limited quantitative performance data exists for vegetated swales, it is known that check dams, slight slopes, permeable soils, dense grass cover, increased contact time, and small storm events all contribute to successful pollutant removal by the swale system. Factors decreasing the effectiveness of swales include compacted soils, short runoff contact time, large storm events, frozen ground, short grass heights, steep slopes, and high runoff velocities and discharge rates.

Conventional vegetated swale designs have achieved mixed results in removing particulate pollutants. A study performed by the Nationwide Urban Runoff Program (NURP) monitored three grass swales in the Washington, D.C., area and found no significant improvement in urban runoff quality for the pollutants analyzed. However, the weak performance of these swales was attributed to the high flow velocities in the swales, soil compaction, steep slopes, and short grass height.

Another project in Durham, NC, monitored the performance of a carefully designed artificial swale that received runoff from a commercial parking lot. The project tracked 11 storms and concluded that particulate concentrations of heavy metals (Cu, Pb, Zn, and Cd) were reduced by approximately 50 percent. However, the swale proved largely ineffective for removing soluble nutrients.

The effectiveness of vegetated swales can be enhanced by adding check dams at approximately 17 meter (50 foot) increments along their length (See Figure 1). These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Finally, the incorporation of vegetated filter strips parallel to the top of the channel banks can help to treat sheet flows entering the swale.

Only 9 studies have been conducted on all grassed channels designed for water quality (Table 1). The data suggest relatively high removal rates for some pollutants, but negative removals for some bacteria, and fair performance for phosphorus.

Table 1 Grassed swale pollutant removal efficiency data							
	Removal Efficiencies (% Removal)						
Study	TSS	TP	TN	NO_3	Metals	Bacteria	Type
Caltrans 2002	77	8	67	66	83-90	-33	dry swales
Goldberg 1993	67.8	4.5	-	31.4	42–62	-100	grassed channel
Seattle Metro and Washington Department of Ecology 1992	60	45	-	-25	2–16	-25	grassed channel
Seattle Metro and Washington Department of Ecology, 1992	83	29	-	-25	46–73	-25	grassed channel
Wang et al., 1981	80	-	-	-	70–80	-	dry swale
Dorman et al., 1989	98	18	-	45	37–81	-	dry swale
Harper, 1988	87	83	84	80	88–90	-	dry swale
Kercher et al., 1983	99	99	99	99	99	-	dry swale
Harper, 1988.	81	17	40	52	37–69	-	wet swale
Koon, 1995	67	39	-	9	-35 to 6	-	wet swale

While it is difficult to distinguish between different designs based on the small amount of available data, grassed channels generally have poorer removal rates than wet and dry swales, although some swales appear to export soluble phosphorus (Harper, 1988; Koon, 1995). It is not clear why swales export bacteria. One explanation is that bacteria thrive in the warm swale soils.

Siting Criteria

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the swale system (Schueler et al., 1992). In general, swales can be used to serve areas of less than 10 acres, with slopes no greater than 5 %. Use of natural topographic lows is encouraged and natural drainage courses should be regarded as significant local resources to be kept in use (Young et al., 1996).

Selection Criteria (NCTCOG, 1993)

- Comparable performance to wet basins
- Limited to treating a few acres
- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

The topography of the site should permit the design of a channel with appropriate slope and cross-sectional area. Site topography may also dictate a need for additional structural controls. Recommendations for longitudinal slopes range between 2 and 6 percent. Flatter slopes can be used, if sufficient to provide adequate conveyance. Steep slopes increase flow velocity, decrease detention time, and may require energy dissipating and grade check. Steep slopes also can be managed using a series of check dams to terrace the swale and reduce the slope to within acceptable limits. The use of check dams with swales also promotes infiltration.

Additional Design Guidelines

Most of the design guidelines adopted for swale design specify a minimum hydraulic residence time of 9 minutes. This criterion is based on the results of a single study conducted in Seattle, Washington (Seattle Metro and Washington Department of Ecology, 1992), and is not well supported. Analysis of the data collected in that study indicates that pollutant removal at a residence time of 5 minutes was not significantly different, although there is more variability in that data. Therefore, additional research in the design criteria for swales is needed. Substantial pollutant removal has also been observed for vegetated controls designed solely for conveyance (Barrett et al, 1998); consequently, some flexibility in the design is warranted.

Many design guidelines recommend that grass be frequently mowed to maintain dense coverage near the ground surface. Recent research (Colwell et al., 2000) has shown mowing frequency or grass height has little or no effect on pollutant removal.

Summary of Design Recommendations

1) The swale should have a length that provides a minimum hydraulic residence time of at least 10 minutes. The maximum bottom width should not exceed 10 feet unless a dividing berm is provided. The depth of flow should not exceed 2/3rds the height of the grass at the peak of the water quality design storm intensity. The channel slope should not exceed 2.5%.

2) A design grass height of 6 inches is recommended.

3) Regardless of the recommended detention time, the swale should be not less than 100 feet in length.

4) The width of the swale should be determined using Manning's Equation, at the peak of the design storm, using a Manning's n of 0.25.

5) The swale can be sized as both a treatment facility for the design storm and as a conveyance system to pass the peak hydraulic flows of the 100-year storm if it is located "on-line." The side slopes should be no steeper than 3:1 (H:V).

6) Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible. If flow is to be introduced through curb cuts, place pavement slightly above the elevation of the vegetated areas. Curb cuts should be at least 12 inches wide to prevent clogging.

7) Swales must be vegetated in order to provide adequate treatment of runoff. It is important to maximize water contact with vegetation and the soil surface. For general purposes, select fine, close-growing, water-resistant grasses. If possible, divert runoff (other than necessary irrigation) during the period of vegetation

establishment. Where runoff diversion is not possible, cover graded and seeded areas with suitable erosion control materials.

Maintenance

The useful life of a vegetated swale system is directly proportional to its maintenance frequency. If properly designed and regularly maintained, vegetated swales can last indefinitely. The maintenance objectives for vegetated swale systems include keeping up the hydraulic and removal efficiency of the channel and maintaining a dense, healthy grass cover.

Maintenance activities should include periodic mowing (with grass never cut shorter than the design flow depth), weed control, watering during drought conditions, reseeding of bare areas, and clearing of debris and blockages. Cuttings should be removed from the channel and disposed in a local composting facility. Accumulated sediment should also be removed manually to avoid concentrated flows in the swale. The application of fertilizers and pesticides should be minimal.

Another aspect of a good maintenance plan is repairing damaged areas within a channel. For example, if the channel develops ruts or holes, it should be repaired utilizing a suitable soil that is properly tamped and seeded. The grass cover should be thick; if it is not, reseed as necessary. Any standing water removed during the maintenance operation must be disposed to a sanitary sewer at an approved discharge location. Residuals (e.g., silt, grass cuttings) must be disposed in accordance with local or State requirements. Maintenance of grassed swales mostly involves maintenance of the grass or wetland plant cover. Typical maintenance activities are summarized below:

- Inspect swales at least twice annually for erosion, damage to vegetation, and sediment and debris accumulation preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the swale is ready for winter. However, additional inspection after periods of heavy runoff is desirable. The swale should be checked for debris and litter, and areas of sediment accumulation.
- Grass height and mowing frequency may not have a large impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.
- Trash tends to accumulate in swale areas, particularly along highways. The need for litter removal is determined through periodic inspection, but litter should always be removed prior to mowing.
- Sediment accumulating near culverts and in channels should be removed when it builds up to 75 mm (3 in.) at any spot, or covers vegetation.
- Regularly inspect swales for pools of standing water. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g. debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained.

Cost

Construction Cost

Little data is available to estimate the difference in cost between various swale designs. One study (SWRPC, 1991) estimated the construction cost of grassed channels at approximately $0.25 per ft^2. This price does not include design costs or contingencies. Brown and Schueler (1997) estimate these costs at approximately 32 percent of construction costs for most stormwater management practices. For swales, however, these costs would probably be significantly higher since the construction costs are so low compared with other practices. A more realistic estimate would be a total cost of approximately $0.50 per ft^2, which compares favorably with other stormwater management practices.

Table 2 Swale Cost Estimate (SEWRPC, 1991)

Component	Unit	Extent	Unit Cost			Total Cost		
			Low	Moderate	High	Low	Moderate	High
Mobilization / Demobilization-Light	Swale	1	$107	$274	$441	$107	$274	$441
Site Preparation								
Clearing[b]	Acre	0.5	$2,200	$3,800	$5,400	$1,100	$1,900	$2,700
Grubbing[c]	Acre	0.25	$3,800	$5,200	$6,600	$950	$1,300	$1,650
General Excavation[d]	Yd^3	372	$2.10	$3.70	$5.30	$781	$1,376	$1,972
Level and Till[e]	Yd^2	1,210	$0.20	$0.35	$0.50	$242	$424	$605
Sites Development								
Salvaged Topsoil Seed, and Mulch[f]	Yd^2	1,210	$0.40	$1.00	$1.60	$484	$1,210	$1,936
Sod[g]	Yd^2	1,210	$1.20	$2.40	$3.60	$1,452	$2,904	$4,356
Subtotal	--	--	--	--	--	$5,116	$9,388	$13,660
Contingencies	Swale	1	25%	25%	25%	$1,279	$2,347	$3,415
Total	--	--	--	--	--	$6,395	$11,735	$17,075

Source: (SEWRPC, 1991)

Note: Mobilization/demobilization refers to the organization and planning involved in establishing a vegetative swale.

[a] Swale has a bottom width of 1.0 foot, a top width of 10 feet with 1:3 side slopes, and a 1,000-foot length.

[b] Area cleared = (top width + 10 feet) x swale length.

[c] Area grubbed = (top width x swale length).

[d] Volume excavated = (0.67 x top width x swale depth) x swale length (parabolic cross-section).

[e] Area tilled = $\left(\text{top width} + \frac{8(\text{swale depth}^2)}{3(\text{top width})}\right) \times$ swale length (parabolic cross-section).

[f] Area seeded = area cleared x 0.5.

[g] Area sodded = area cleared x 0.5.

Table 3 Estimated Maintenance Costs (SEWRPC, 1991)

Component	Unit Cost	Swale Size (Depth and Top Width)		Comment
		1.5 Foot Depth, One-Foot Bottom Width, 10-Foot Top Width	3-Foot Depth, 3-Foot Bottom Width, 21-Foot Top Width	
Lawn Mowing	$0.85 / 1,000 ft²/ mowing	$0.14 / linear foot	$0.21 / linear foot	Lawn maintenance area=(top width + 10 feet) x length. Mow eight times per year
General Lawn Care	$9.00 / 1,000 ft²/ year	$0.18 / linear foot	$0.28 / linear foot	Lawn maintenance area = (top width + 10 feet) x length
Swale Debris and Litter Removal	$0.10 / linear foot / year	$0.10 / linear foot	$0.10 / linear foot	–
Grass Reseeding with Mulch and Fertilizer	$0.30 / yd²	$0.01 / linear foot	$0.01 / linear foot	Area revegetated equals 1% of lawn maintenance area per year
Program Administration and Swale Inspection	$0.15 / linear foot / year, plus $25 / inspection	$0.15 / linear foot	$0.15 / linear foot	Inspect four times per year
Total	--	$0.58 / linear foot	$ 0.75 / linear foot	--

Maintenance Cost

Caltrans (2002) estimated the expected annual maintenance cost for a swale with a tributary area of approximately 2 ha at approximately $2,700. Since almost all maintenance consists of mowing, the cost is fundamentally a function of the mowing frequency. Unit costs developed by SEWRPC are shown in Table 3. In many cases vegetated channels would be used to convey runoff and would require periodic mowing as well, so there may be little additional cost for the water quality component. Since essentially all the activities are related to vegetation management, no special training is required for maintenance personnel.

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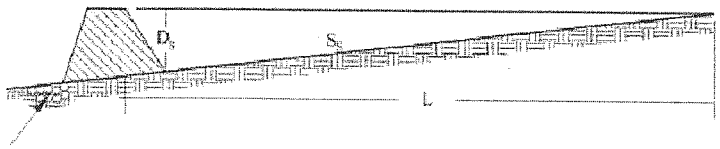
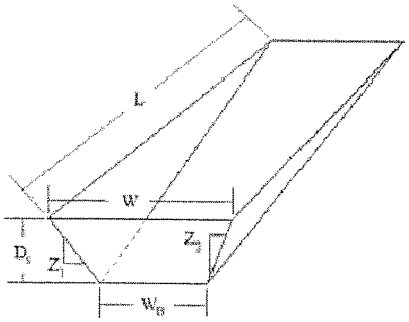


Provide for scour protection.

(a) Cross section of swale with check dam.



(b) Dimensional view of swale impoundment area.

Notation:
L = Length of swale impoundment area per check dam (ft)
D_S = Depth of check dam (ft)
S_S = Bottom slope of swale (ft/ft)
W = Top width of check dam (ft)
W_B = Bottom width of check dam (ft)
Z_{ISS} = Ratio of horizontal to vertical change in swale side slope (ft/ft)

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JOB Route 67 Self Storage
SHEET NO. Bio-Swale Treatment Calc. OF
CALCULATED BY RLB DATE 11-27-07
CHECKED BY DATE
SCALE LK 0381

Determine Treatment Capacity of Proposed Vegetated Bio-Swales:

Node 13-15:

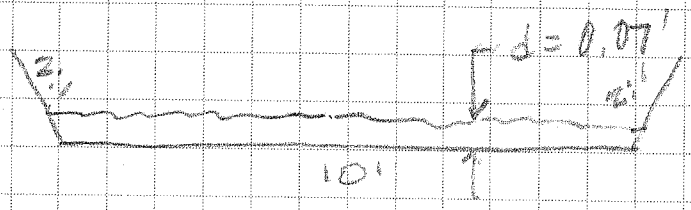
Flow based calculation utilizing rational method:

$Q = CIA$ Q = peak flow
C = runoff coefficient (0.9)
I = intensity (0.2 for 85th percentile)
A = basin area

$A = 0.05 + 0.30 = 0.35$ acres

$Q = CIA = (0.9)(0.2)(0.35) = 0.063$ cfs $= 28.3$ gpm

Proposed Swale:



$S = 0.01$ (1%)

Calculate travel time through the treatment swale:

(see attached Mannings Eq. open channel analysis of trap. channel)

$Q = 0.063$ cfs, $d = 0.07$ feet, $v = 0.09$ fps

Travel time = Length / velocity $L = 100$

$= 100 / .09 = 1111$ seconds $= 18.5$ min.

* Complies with required 10 minute min. travel time.

```
      CHANNEL Z1(HORIZONTAL/VERTICAL) =     2.00
              Z2(HORIZONTAL/VERTICAL) =     1.00
      BASEWIDTH(FEET) =     10.00
      CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.010000
      UNIFORM FLOW(CFS) =         0.06
      MANNINGS FRICTION FACTOR = 0.2500

===============================================================================
====
      NORMAL-DEPTH FLOW INFORMATION:

-------------------------------------------------------------------------------
----
      >>>>> NORMAL DEPTH(FEET) =    0.07
      FLOW TOP-WIDTH(FEET) =         10.20
      FLOW AREA(SQUARE FEET) =             0.67
      HYDRAULIC DEPTH(FEET) =      0.07
      FLOW AVERAGE VELOCITY(FEET/SEC.) =      0.09
      UNIFORM FROUDE NUMBER =     0.064
      PRESSURE + MOMENTUM(POUNDS) =              1.41
      AVERAGED VELOCITY HEAD(FEET) =       0.000
      SPECIFIC ENERGY(FEET) =       0.067

===============================================================================
====
      CRITICAL-DEPTH FLOW INFORMATION:

-------------------------------------------------------------------------------
----
      CRITICAL FLOW TOP-WIDTH(FEET) =         10.03
      CRITICAL FLOW AREA(SQUARE FEET) =            0.11
      CRITICAL FLOW HYDRAULIC DEPTH(FEET) =      0.01
      CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) =      0.59
      CRITICAL DEPTH(FEET) =      0.01
      CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) =             0.11
      AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) =       0.005
      CRITICAL FLOW SPECIFIC ENERGY(FEET) =       0.016

===============================================================================
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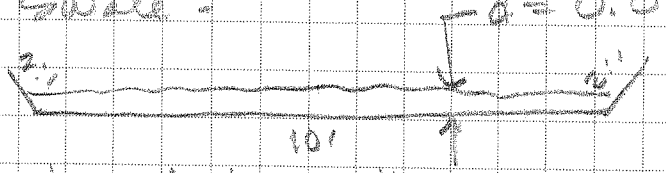
Node 4:

A = 0.40

Q = CIA
= (0.9)(0.2)(0.40) = 0.072 cfs = 32.3 gpm

Proposed Swale -



S = 0.02 (2%)

Calculate travel time through the treatment swale =
(See attached Manning's Eq. open channel analysis of trap. channel)

Q = 0.072 cfs, d = 0.06 feet, V = 0.12 ft/sec.

travel time = length / travel time L = 70'

= 70/0.12 = 583 sec. = 9.7 minutes
≥ 10 minutes

* Complies with required 10 minute min. travel time

Problem Descriptions:

```
**********************************************************************************
>>>>CHANNEL INPUT INFORMATION<<<<
----------------------------------------------------------------------------------
    CHANNEL Z1(HORIZONTAL/VERTICAL) =     2.00
            Z2(HORIZONTAL/VERTICAL) =     1.00
    BASEWIDTH(FEET) =     10.00
    CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.020000
    UNIFORM FLOW(CFS) =         0.07
    MANNINGS FRICTION FACTOR = 0.2500
==================================================================================
    NORMAL-DEPTH FLOW INFORMATION:
----------------------------------------------------------------------------------
    >>>>> NORMAL DEPTH(FEET) =   0.06
    FLOW TOP-WIDTH(FEET) =         10.18
    FLOW AREA(SQUARE FEET) =             0.60
    HYDRAULIC DEPTH(FEET) =      0.06
    FLOW AVERAGE VELOCITY(FEET/SEC.) =      0.12
    UNIFORM FROUDE NUMBER =    0.088
    PRESSURE + MOMENTUM(POUNDS) =              1.11
    AVERAGED VELOCITY HEAD(FEET) =       0.000
    SPECIFIC ENERGY(FEET) =       0.059
==================================================================================
    CRITICAL-DEPTH FLOW INFORMATION:
----------------------------------------------------------------------------------
    CRITICAL FLOW TOP-WIDTH(FEET) =         10.03
    CRITICAL FLOW AREA(SQUARE FEET) =             0.11
    CRITICAL FLOW HYDRAULIC DEPTH(FEET) =      0.01
    CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) =      0.67
    CRITICAL DEPTH(FEET) =      0.01
    CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) =             0.13
    AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) =       0.007
    CRITICAL FLOW SPECIFIC ENERGY(FEET) =       0.018
==================================================================================
```

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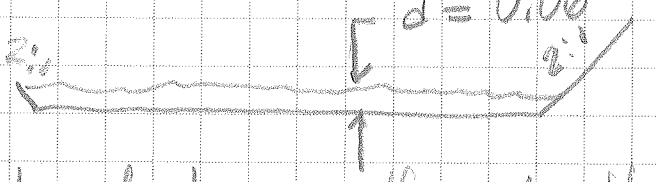
Node 16 :

$Q = CIA$ $A = 0.42$ acres

$= (0.9)(0.2)(0.42) = 0.076$ cfs $= 33.9$ gpm

Proposed Swale



$S = 2.22\% = 0.0222$

Calculate travel time through the treatment swale :

(see attached Manning's Equation for open channel flow analysis for trap. channel

$Q = 0.076$ cfs, $d = 0.06$ feet, $V = 0.13$ ft/sec

travel time = length / velocity $L = 100'$

$100 / 0.13 = 769$ seconds $= 12.8$ minutes

$>$ 10 minutes

* Complies with required 10 minute min. travel time.

Problem Descriptions:

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 >>>>CHANNEL INPUT INFORMATION<<<<

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     CHANNEL Z1(HORIZONTAL/VERTICAL) =     2.00
             Z2(HORIZONTAL/VERTICAL) =     1.00
     BASEWIDTH(FEET) =    10.00
     CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.022200
     UNIFORM FLOW(CFS) =         0.08
     MANNINGS FRICTION FACTOR = 0.2500

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     NORMAL-DEPTH FLOW INFORMATION:

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     >>>>> NORMAL DEPTH(FEET) =    0.06
     FLOW TOP-WIDTH(FEET) =         10.18
     FLOW AREA(SQUARE FEET) =            0.60
     HYDRAULIC DEPTH(FEET) =     0.06
     FLOW AVERAGE VELOCITY(FEET/SEC.) =      0.13
     UNIFORM FROUDE NUMBER =    0.093
     PRESSURE + MOMENTUM(POUNDS) =             1.12
     AVERAGED VELOCITY HEAD(FEET) =       0.000
     SPECIFIC ENERGY(FEET) =       0.059

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     CRITICAL-DEPTH FLOW INFORMATION:

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     CRITICAL FLOW TOP-WIDTH(FEET) =         10.04
     CRITICAL FLOW AREA(SQUARE FEET) =            0.13
     CRITICAL FLOW HYDRAULIC DEPTH(FEET) =      0.01
     CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) =      0.58
     CRITICAL DEPTH(FEET) =      0.01
     CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) =             0.14
     AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) =       0.005
     CRITICAL FLOW SPECIFIC ENERGY(FEET) =       0.018

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ATTACHMENT F

OPERATION AND MAINTENANCE PROGRAM FOR TREATMENT BMPS

5.0 Maintenance Requirements for Treatment BMPs

This chapter provides guidelines for preparation of a Stormwater Maintenance Plan (SMP) for any structural treatment BMPs associated with discretionary project. The SMP is prepared by the proponent and incorporated in the project SWMP.

The effectiveness of the SWMP relies partially on maintenance of any Structural Treatment BMPs proposed for a project. The performance of permanent BMPs is dependent on the maintenance efforts conducted to ensure its ability to treat pollutant loads. The WPO obligates dischargers, and owners and occupants of land to maintain all structural treatment BMPs that are part of their project. The County shall not consider structural BMPs "effective," and therefore shall not accept storm water BMPs as meeting the MEP standard, unless a mechanism is in place that will ensure ongoing long-term maintenance of all structural BMPs.

The SMP describes the responsibilities for the care and upkeep of these permanent BMPs. Improper or inadequate maintenance of this type of BMP could impact storm water and receiving water quality. The SMP is the component of the SWMP that describes:

- The program to maintain permanent structural treatment BMPs including frequency and type of maintenance, safety precautions, and reporting/record keeping.
- The program to implement maintenance of these BMPs may be included as part of other ongoing maintenance activities for the project.
- Maintenance activities must include information and responses concerning potential storm water pollution from accidental spills, illicit connections, illegal discharges and illegal dumping within the Structural Treatment BMPs.
- On-going funding for the proposed maintenance activities.

Early consideration and planning of maintenance efforts ensures that water quality will be addressed for many years to come. Development of a SMP is required when submitting the Project Application if the proposed project includes Structural Treatment BMPs. In addition, the SMP must meet with County approval and is a living document, which could require changes during project development.

Structural Treatment BMPs that must be maintained include but are not limited to the following:

1. Biofilters
2. Detention Basins
3. Infiltration BMP
4. Wet Ponds and Wetlands
5. Storm Drain Inserts, Oil/Water separator, Catch basin insert & screens.
6. Filtration Systems

7. Hydrodynamic Separators

5.1 Proof of a Mechanism to Ensure Maintenance of Treatment BMPs

As part of project review, if a project proponent is required to include interim or permanent structural BMPs in project plans, and if the SWMP does not provide a mechanism for BMP maintenance, the County will require that the applicant provide verification of maintenance requirements through such means as may be appropriate, at the discretion of the County, including, but not limited to covenants, legal agreements, maintenance agreements, and/or conditional use permits. The project proponent is required to provide a signed statement acknowledging responsibility for structural BMP maintenance, repair and replacement until the County accepts an alternative mechanism to ensure such maintenance, repair and replacement.

Potentially acceptable mechanisms for ensuring BMP maintenance includes the following:

(a) County maintenance. The County may agree to accept ownership of and to maintain the BMP, under such conditions as it deems appropriate.

(b) Maintenance by another public entity. The County may agree that another public or acceptable quasi-public entity (e.g., the County Flood Control District, a state or federal resource agency, or a conservation conservancy) may assume responsibility for maintenance, repair and replacement of the BMP in lieu of the developer. The County may require that some or all estimated maintenance costs be front-funded or reliably guaranteed, (e.g., through a trust fund, assessment district fees, bond, letter of credit or similar means). In addition, the County may seek protection from liability by appropriate releases and indemnities.

    The developer must provide any public entity accepting maintenance obligations sufficient ownership or easement interests to allow maintenance, repair and replacement of BMPs. If structural BMPs are located within a public area proposed for transfer, they will be the responsibility of the developer until the County or other public entity accepts them. Structural BMPs proposed for transfer to any other public entity must be approved by the County prior to installation. The County shall be involved in the negotiation of maintenance requirements with any other public entities accepting maintenance responsibilities. The County must be identified as a third party beneficiary empowered to enforce any such maintenance agreement.

(c) Maintenance by a subsequent owner. The County may agree that sufficient assurance of maintenance is provided by the responsibility the WPO imposes on subsequent owners of the BMP to maintain that BMP. The County may decline to accept this mechanism as an adequate developer assurance if the County concludes in its sole discretion that any

subsequent owner(s) may be unable or unwilling to maintain, repair or replace the BMP despite the legal obligation to do so. The County may condition acceptance of this mechanism on a backup agreement with the developer, a related natural person to ultimately be accountable to the County to pay all costs for BMP maintenance, repair or replacement if a subsequent owner fails to perform. Acknowledgements or responsibility or other contractual agreement with the subsequent owners may also be required.

(d) County Service Area or Assessment District. The developer can create a County Service Area (CSA) or other funding mechanism to provide funds for BMP maintenance, repair and replacement on an ongoing basis. If that mechanism could be compromised or eliminated by any subsequent vote, the County may condition acceptance of this mechanism on an agreement that would preclude such compromise or elimination, and/or on a backup agreement with the developer or a related natural person to ultimately be accountable to the County to pay all costs for BMP maintenance, repair or replacement if funding and maintenance by a CSA or Assessment District proved to be inadequate for any reason.

(e) Lease provisions. In those cases where the County holds title to the land in question, and the land is being leased to another party for private or public use, the County may assure storm water BMP maintenance, repair and replacement through conditions in the lease.

(f) Conditional use permits. For discretionary projects that require a use permit, the County may agree that the inclusion of appropriate terms in the use permit will provide sufficient assurance maintenance of storm water BMPs. The County may condition acceptance of this mechanism on a backup agreement with the developer or a related natural person to ultimately be accountable to the County to pay all costs for BMP maintenance, repair or replacement if a subsequent owner fails to perform.

(g) Other mechanisms. The County in its discretion may accept other mechanisms for ensuring BMP maintenance, repair and replacement.

5.1.1 Right to Condition Acceptance of any Proposed Mechanism

The County in its discretion may decline to accept any proposed mechanism for assuring BMP maintenance, repair or replacement that is not supported by an adequate and reliable source of funds. The County in its discretion may also require that any such proposed mechanism be supported by back up agreements including but not limited to a back-up maintenance agreement with the developer or a related natural person.

5.2 Guidelines for Maintenance Plan Development

Maintenance activities or programs must be specified in sufficient detail for a third party to easily determine the actions necessary. The following items are required for the project SMP:

a. Information concerning the maintenance for each Post-construction Structural Treatment BMP, including routine actions, maintenance indicators, field measurement, measurement frequency, maintenance activity, and site-specific requirements;
b. Proposed provisions for monitoring of BMP and provisions for County compliance inspections;
c. List of indicator thresholds that will trigger maintenance activity.
d. Maintenance Activities Checklist;
e. Proposed methods of disposing of sediment and collected pollutants.
f. Cost estimate for annual maintenance activities, and;
g. Proposed mechanism for on-going funding of maintenance activities per section 5.4.

Specific format and guidelines are included within Appendix C. In addition, Appendix H includes maintenance task and associated cost. The project proponent, at their discretion, can use this data as a preliminary estimate for the maintenance efforts needed for the project. Above items may be shown on other application documents such as the tentative map, preliminary grading plan, or preliminary drainage study. If this is done, the SWMP document must identify where each of these component pieces can be found.

Applicants must propose for County determination the appropriate maintenance mechanism for selected BMPs. The BMPs should fit into one of the following categories:

FIRST CATEGORY:

The County should have only minimal concern for ongoing maintenance. The proposed BMPs inherently "take care of themselves", or property owners can naturally be expected to do so as an incident of taking care of their property

Typical BMPs:

- Biofilters (Grass swale, Grass strip, vegetated buffer)
- Infiltration BMP (basin, trench)

Mechanisms to Assure Maintenance:

1. Stormwater Ordinance Requirement: The WPO requires this ongoing maintenance. In the event that the mechanisms below prove ineffective, or in addition to enforcing those mechanisms, civil action, criminal action or administrative citation could also be pursued for violations of the ordinance.

2. Public Nuisance Abatement: Under the WPO failure to maintain a BMP would constitute a public nuisance, which may be abated under the Uniform Public Nuisance Abatement Procedure. This provides an enforcement mechanism additional to the above, and would allow costs of maintenance to be billed to the owner, a lien placed on the property, and the tax collection process to be used.
3. Notice to Purchasers. Section 67.819(e) of the WPO requires developers to provide clear written notification to persons acquiring land upon which a BMP is located, or others assuming a BMP maintenance obligation, of the maintenance duty.
4. Conditions in Ongoing Land Use Permits: For those applications (listed in SO Section 67.804) upon whose approval ongoing conditions may be imposed, a condition will be added which requires the owner of the land upon which the stormwater facility is located to maintain that facility in accordance with the requirements specified in the SMP. Failure to perform maintenance may then be addressed as a violation of the permit, under the ordinance governing that permit process.
5. Subdivision Public Report: Tentative Map and Tentative Parcel Map approvals will be conditioned to require that, prior to approval of a Final or Parcel Map, the subdivider shall provide evidence to the Director of Public Works, that the subdivider has requested the California Department of Real Estate to include in the public report to be issued for the sales of lots within the subdivision, a notification regarding the maintenance requirement. (The requirement for this condition would not be applicable to subdivisions which are exempt from regulation under the Subdivided Lands Act, or for which no public report will be issued.)

Funding:
None Required.

SECOND CATEGORY:

The County needs to assure ongoing maintenance. The nature of the proposed BMPs indicates that it is appropriate for property owners to be given primary responsibility for maintenance, on a perpetual basis (unless a stormwater utility is eventually formed). However, the County (in a "backup" role) needs to be able to step in and perform the maintenance if property owner fails, and needs to have security to provide funding for such backup maintenance. Security for "backup" maintenance after the interim period (5 years) would not be provided, however primary owner maintenance responsibility would remain. If a stormwater utility or other permanent mechanism is put into place, it could assume either a primary or backup maintenance role.

Typical BMPs:

- Biofilters;
- Small Detention Basins;

- Infiltration BMP, and;
- Single Storm Drain Inserts, Oil/Water separator, Catch basin insert & screens.

Mechanisms to Assure Maintenance:

1. Stormwater Ordinance Requirement: The WPO requires this ongoing maintenance. In the event that the mechanisms below prove ineffective, or in addition to enforcing those mechanisms, civil action, criminal action or administrative citation could also be pursued for violations of the ordinance.
2. Public Nuisance Abatement: Under the WPO failure to maintain a BMP would constitute a public nuisance, which may be abated under the Uniform Public Nuisance Abatement Procedure. This provides an enforcement mechanism additional to the above, and would allow costs of maintenance to be billed to the owner, a lien placed on the property, and the tax collection process to be used.
3. Notice to Purchasers. Section 67.819(e) of the WPO requires developers to provide clear written notification to persons acquiring land upon which a BMP is located, or others assuming a BMP maintenance obligation, of the maintenance duty.
4. Conditions in Ongoing Land Use Permits: For those applications (listed in WPO Section 67.804) upon whose approval ongoing conditions may be imposed, a condition will be added which requires the owner of the land upon which the stormwater facility is located to maintain that facility in accordance with the requirements specified in the SMP. Failure to perform maintenance may then be addressed as a violation of the permit, under the ordinance governing that permit process.
5. Subdivision Public Report: Tentative Map and Tentative Parcel Map approvals will be conditioned to require that, prior to approval of a Final or Parcel Map, the subdivider shall provide evidence to the Director of Public Works, that the subdivider has requested the California Department of Real Estate to include in the public report to be issued for the sales of lots within the subdivision, a notification regarding the maintenance requirement. (The requirement for this condition would not be applicable to subdivisions which are exempt from regulation under the Subdivided Lands Act, or for which no public report will be issued.)
6. BMP Maintenance Agreement with Easement and Covenant: An agreement will be entered into with the County, which will function three ways:
   (a) It will commit the land to being used only for purposes of the BMP;
   (b) It will include an agreement by the landowner, to maintain the facilities in accordance with the SMP (this obligation would be passed on to future purchasers or successors of the landowner, as a covenant); and

(c) It will include an easement giving the County the right to enter onto the land (and any necessary adjacent land needed for access) to maintain the BMPs.

This would be required of all applications listed in WPO Section 67.804. In the case of subdivisions, this easement and covenant would be recorded on or prior to the Final or Parcel Map.

Funding:

Developer would provide the County with security to substantiate the maintenance agreement, which would remain in place for an interim period of 5 years. The amount of the security would equal the estimated cost of 2 years of maintenance activities. The security can be a Cash Deposit, Letter of Credit or other form acceptable to the County.

THIRD CATEGORY:

The County needs to assure ongoing maintenance is heightened, to the point that the County is willing to take on this responsibility. A permanent funding mechanism needs to be established.

Typical BMPs:

- Biofilters
- Detention Basins
- Infiltration BMP
- Wet Ponds and Wetlands
- Multiple Storm Drain Inserts, Oil/Water separators, Catch basin insert & screens.
- Filtration Systems
- Hydrodynamic Separators

Mechanisms to Assure Maintenance:

1. Dedication of BMP to County: The developer would be required to dedicate the BMP (and the property on which it is located) to the County. This could be an immediate dedication, or for cases where the County would not want to assume responsibility for the facility for some time (e.g., until after construction is completed), then an IOD could be used instead.
2. County Maintenance Documentation: Where the County has assumed maintenance responsibility, internal County program documentation would memorialize the required maintenance.

Funding:

The primary funding mechanism will be a special assessment under the authority of the Flood Control District. The assessment will be collected with property tax. Because this primary funding mechanism will require substantial amount of time

to establish and collect assessments, a developer fee will be needed to cover the initial maintenance period of 24 months.

FOURTH CATEGORY

Proposed BMPs that are recognized from the beginning as deserving of public ownership and maintenance; normally, these would serve a public need and benefit larger in scope than an individual development project.

Typical BMPs:

- Biofilters
- Detention Basins
- Wet Ponds and Wetlands
- Retrofit public Storm Drain Inserts, Oil/Water separator, Catch basin insert & screens.
- Filtration Systems
- Hydrodynamic Separators

Mechanisms to Assure Maintenance:

1. Dedication of BMP to County: The developer would be required to dedicate the BMP (and the property on which it is located) to the County. This could be an immediate dedication, or for cases where the County would not want to assume responsibility for the facility for some time (e.g., until after construction is completed), then an IOD could be used instead.
2. County Maintenance Documentation: Internal County or Flood Control District maintenance program documentation would memorialize the required maintenance.

Funding:

A permanent source will be implemented; options include gas tax, TransNet, General Fund, or new special taxes or fees.

5.2.1 Determination of Appropriate Maintenance Mechanism(s):

Table 5.1 outlines the appropriate determination of public / private responsibility, and mechanism(s) for each of the four categories.

Table 5.1 Determinations of Appropriate Maintenance Mechanism(s)

Increased risk, complexity, cost or other maintenance factors				
(Private Responsibility)			(Public Responsibility)	
	First Category	**Second Category**	**Third Category**	**Fourth Category**
Importance of Maintenance	Minimal concern; inherent in BMP or property stewardship	Need to make sure private owners maintain, and provide County ability to step in & perform maintenance	Warrants Flood Control Dist. (FCD) assuming responsibility, with funding related to project	Broader public responsibility for maintenance and funding (beyond project)
Typical BMPs	Biofilter (Grass swale, grass strip, vegetated buffer); Infiltration basin/trench	[First cat. plus:] Minor wetland swale; Small detention basin; Single storm drain insert / Oil-water separator / Catch basin insert & screen	[Second cat. plus:] Wetland swale or bioretention; Detention basin (extended/dry); Wet ponds & wetlands; Multiple storm drain inserts; Filtration Systems	[Third cat. plus:] Retrofit public storm drain inserts, etc. Master plan facility that serves area larger than project
Mechanisms	1. Stormwater Ordinance[9] requirement [section 67.819(a)&(b)], with code enforcement 2. Nuisance abatement with costs charged back to property owner 3. Condition in ongoing permit such as a Major Use Permit (if project has MUP) 4. Notice to new purchasers [67.819(e)] 5. Subdivision public report "white papers" to include notice of maintenance responsibility	6. Recorded easement agreement w/covenant binding on successors	1. Dedication to FCD. 2. Formation of benefit area 3. FCD maintenance documentation	1. Dedication to FCD or County. 2. FCD / County maintenance documentation
Funding Source(s)	None necessary	Security (Cash deposit, Letter of Credit, or other acceptable to County) for interim period. Agreement for security to contain provisions for release or refund, if not used.	**Start-up interim:** Developer fee covering 24 months of costs **Permanent:** FCD Assessment per FCD Act Sec 105-17.5	Varies: gas tax for BMP in road ROW, Transnet for CIP projects, Special funding or General funding for others.

5.3 County Review of Maintenance Plan

County staff reviews the SMP as part of the overall project application and for compliance with the WPO and SSM. These reviews include the departments of Public Works for engineering and cost estimates and Planning & Land Use for environmental concerns. Information from the SMP shall be used in formulating CEQA responses and findings, findings of project code compliance, and in

[9] County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance (S.D.Co.Code Sec. 67.801 et seq.)

proposing conditions for the project. The County has the final authority for deciding what is required in the SMP and when a proposed SMP is adequate.

Staff reviewing the maintenance proposals will pay careful attention to the BMPs proposed, to:

(a) Select the appropriate BMPs in view of ongoing maintenance costs; and
(b) Determine whether it is appropriate for the BMPs to remain in private ownership and responsibility, or to be taken over by the County (or Flood Control District).

ATTACHMENT G

FISCAL RESOURCES

The project property owner shall provide the fiscal resources necessary to maintain the onsite drainage system and the permanent stormwater best management practices. The anticipated annual cost of maintaining the proposed vegetated swales will be approximately $3,000. The anticipated annual cost of maintaining the proposed catch basin filters will be approximately $1,000. (Approximate cost of maintenance obtain from Appendix H of SD County Stormwater Maintenance Guidelines).

ATTACHMENT H

CERTIFICATION SHEET

This Stormwater Management Plan has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attest to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

Robert L. Bruckart

3-10-09

Robert L. Bruckart, RCE 48158
Registered Civil Engineer

Date